FLORIDA POLYTECHNIC UNIVERSITY

Course Information

- **Course Number and Title**: EML 4950C, Engineering Capstone Design 1
- **Credit Hours:** 3 (2 lecture/1 lab)
- **Academic Term:** Fall 2025

Instructor Information

- **Instructor:** Dr. Apurva Patel
- **Office Location:** BARC 1176
- **Office Hours**:
  - [*In-person @ BARC 1176*] Mon & Wed: 9:00 – 10:30; Tue & Thu: 10:00 – 11:30
  - [*Virtually on Teams*] By appointment
- **Email address**: apurvapatel@floridapoly.edu

Course Delivery and Course Description

- **Delivery Mode**: All class meetings are in person and on campus unless pre-announced otherwise for specific days. It is important for students to attend so they can participate in the discussion; lectures will be used to present new topics each week and to have a broad engineering design related discussion.
- **Course Website**: https://floridapolytechnic.instructure.com/courses/8696
- **Official Catalog Course Description**: Teams of students will design, build and test a solution to a real-world design problem appropriate to each student's program of study. Students will demonstrate the solution they develop at the end of the course. Verbal and written technical and managerial reports are also required. This course meets communication/writing-intensive requirements.
  - **Course Pre and/or Co-Requisites**: (EGN3016CENGR or EML3100ENGR) and (EML3015ENGR or EML3015CENGR) and (EGN3365ENGR or EMA4006ENGR)
  - **Communication/Computation Skills Requirement (6A-10.030)**: N
- **Required Texts and Materials:** Various recommended texts will be discussed during class
  - Various dependent upon the nature of each specific project

Course Objectives and Outcomes

- **Course Objectives**: The unified capstone design experience at Florida Polytechnic University is structured to provide a comprehensive, interdisciplinary approach to solving real-world problems through design thinking and systematic problem-solving. This course is taken by students from various STEM majors, including computer science, data science, electrical engineering, computer engineering, cybersecurity engineering, environmental engineering, business analytics, mechanical engineering, applied mathematics, engineering physics, civil engineering, and industrial engineering. The course emphasizes the development of practical skills and knowledge necessary to conceptualize, design, prototype, and refine solutions across various domains. This program is meticulously designed to closely mimic the industrial environment, ensuring that graduates are well-prepared for professional challenges.
- **Course Learning Outcomes**:
  - Apply Systematic Problem-Solving Processes: Understand and effectively utilize a systematic approach to identify, analyze, and solve complex problems.
  - Execute Effective Planning and Scheduling: Develop and implement detailed project plans and schedules to ensure timely and efficient project completion.
  - Problem Decomposition: Break down large, complex problems into manageable subsets to facilitate easier analysis and solution development.

- Customer-Centric Solution Evaluation: Assess potential concepts and solutions from the perspective of customer needs and requirements, ensuring alignment with their expectations.
- Concept Selection and Finalization: Select the most appropriate concept or solution through a structured evaluation process and finalize the approach to address the given problem.
- Testing and Validation: Conduct thorough testing and validation of the final solution to ensure it meets the defined criteria and performs as expected in real-world conditions.
- Professional Communication Skills: Demonstrate proficiency in professional communication, including writing detailed reports, delivering oral presentations, creating posters, and utilizing multimedia tools.
- Professional Team Skills: Exhibit strong professional skills in teamwork, leadership, and team management, contributing effectively to group efforts and achieving common goals.
- Awareness of Broader Impacts: Understand and consider the broader impacts of the selected solution, including ethical, environmental, economic, and social implications.

- **Alignment with Program Outcomes**:

Course Learning Outcome	Learning Level (e.g., Bloom's, Anderson/ Krathwohl; Rogers/Hatfield (ABET Assessment Example)	ABET Student Outcomes		
		EAC	CAC	ANSAC
Understand and apply a systematic process to solve problems.	**Apply:** Applying the facts, rules, concepts, and ideas; **Assessment:** (Capstone 2, Specific Criteria from Panel 2)	ABET 1, 6, 7	ABET 1	ABET 1
Execute planning and scheduling.	**Create:** Combining parts to make a new whole; **Assessment:** (Capstone 1, Specific Criteria from Panel 2)	ABET 5	ABET 5	ABET 6
Decompose larger problems into subsets.	**Analyze:** Breaking down information into component parts; **Assessment:** (Capstone 1, Specific Criteria from Panel 1)	ABET 1, 6	ABET 1	ABET 1
Evaluate potential concepts/solutions from a customer needs perspective.	**Analyze:** Breaking down information into component parts; **Assessment:** (Capstone 1, Specific Criteria from Panel 2)	ABET 1, 6	ABET 2	ABET 2
Select and finalize a concept/solution to solve a given problem.	**Create:** Combining parts to make a new whole; **Assessment:** (Capstone 2, Specific Criteria from Panel 2)	ABET 1, 2, 7	ABET 2	ABET 2
Perform testing and validation on final solution.	**Analyze:** Breaking down information into component parts; **Assessment:** (Capstone 2, Specific Criteria from Panel 2)	ABET 1, 4, 6	ABET 2	ABET 2, 3
Demonstrate professional communication skills, e.g., written report, oral presentation, poster, and/or multimedia.	**Apply:** Applying the facts, rules, concepts, and ideas; **Assessment:** (Capstone 1 & 2, Specific Criteria from Panel 2) (Capstone 2, Section of Final Report Rubric) (Capstone 2 Individual Oral Reflection)	ABET 3, 3	ABET 3	ABET 4
Demonstrate professional skills in teaming, leadership, and team management.	**Apply:** Applying the facts, rules, concepts, and ideas; **Assessment:** (Capstone 2, Peer Evaluation Score)	ABET 5	ABET 5	ABET 6
Understand broader impacts of selected solution.	**Understand:** Identify and explain concepts or ideas; **Assessment:** (Capstone 2, Section of Final Report Rubric)	ABET 4	ABET 4	ABET 5

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
- **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit https://floridapolytechnic.libguides.com/writingservices.

Civility and Collegiality

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. Communication, written, oral and behavioral, between faculty and students must remain respectful. Within and outside of the classroom, students must refrain from derogatory comments toward the faculty member and their fellow students, and faculty as well must refrain from derogatory comments toward their students. Faculty and students should address each other with respect, in accordance with the wishes of the faculty and the students: for example, no one should be addressed by their last name alone.

Faculty from the outset of a course can and should specify what constitutes activities and behavior that take away from, that diminish, the educational environment. An individual student's distracting behavior impedes the education of fellow students, which itself is a form of disrespect. Civility and collegiality also include respecting each other's time: for example, neither students nor faculty should arrive late to class (unless unforeseen, pressing circumstances prevail); faculty should be present at the posted office hours; and students and faculty should be punctual when meeting times are scheduled. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.

Course Policies

Attendance

- Students in **face-to-face (this includes labs and C-courses)** courses are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).
- Attendance at all class meetings is expected. Absence does not excuse a student from material covered or any activity done on that day, nor does it extend a deadline.
- Students should inform the instructor as soon as possible if an absence is expected. The instructor should be contacted as soon as possible if an absence was due to an unforeseen emergency. Documentation may be required in either case.
- Attendance is ***mandatory during presentation days*** (when your team or other teams present). If you are not present during any presentation day you will not receive credit for that presentation milestone (In Class or Panel Presentations).

Email Policy

Emails must be sent from your Florida Poly email account to the Florida Poly email address of the instructor (mbohm@floridapoly.edu). Please allow up to 36 hours on weekdays for a response, after which you may send a follow-up email. Emails must be composed in a professional manner with a greeting, signature, and in an organized fashion. Start the subject line with "[Capstone – TEAM XYZ]" for a quicker response time. **NO CANVAS Messages.**

Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a code of conduct referral.

Late Work/Make-up work

Late work is generally not accepted unless the student or team has communicated and come to an agreement with the instructor in advance.

Grading Scale

Grade	Percentage
A	100 – 93
A-	92 – 90
B+	89 – 86
B	85 – 83
B-	82 – 80
C+	79 – 76
C	75 – 70
D	69 – 60
F	59 – 0

Assignment/Evaluation Methods

Activity	Weight
Individual Component	35%
Progress Memo 1	5%
Mid Term In Class	5%
Mid Term Panel	10%
Progress Memo 2	5%
Final In Class	5%
Final Panel	10%
Final Report	10%
Intra Team Peer Evaluation	15%
Total:	100%

While many assignments are considered team grades your individual contribution to each assignment will be factored into the grade for that assignment. For example, a team of 4 received an 18/20 for an assignment. The members of the team Susie, John, Alex and Steve contributed 30%, 30%, 30% and 10% respectively. Therefore Susie, John and Alex would all receive an 18 for the assignment but Steve would only receive a 6 since he contributed 2/3 less than the other team members.

Individual assignments will go along with lecture material and be about generalized design processes and related tools. Generally, students are expected to spend at least two hours completing "out of class student

work" for each hour in class. **HOWEVER** – since this is capstone, be prepared to spend even more time outside of class to have a successful project.

Professional Development Requirement

As an integral component of the Capstone Design Program, all students are required to participate in professional development modules focused on career and graduate school preparedness. These modules are designed to equip students with essential skills and knowledge for their professional journey, whether they choose to enter the workforce or pursue further academic endeavors. Topics covered include resume building, interview techniques, networking strategies, and graduate school application processes. Participation in these modules is mandatory unless a student can provide documented proof of employment or acceptance into a graduate program. Once such proof is submitted and verified, the student may opt out of the remaining professional development modules, having demonstrated readiness for their next career or academic step.

Project Placement and Team Dynamics

Students are placed on project teams based on a survey they complete, which reports their skills and other relevant attributes. Faculty members then collaborate to align student skills with the needs of the various projects. This process ensures that each project is staffed with a team capable of tackling the specific challenges it presents.

In **astronomically extreme cases**, a student may be removed from a project team. Reasons for removal could include, but are not limited to, unprofessional behavior toward team members, faculty, or sponsors, or severe personality conflicts that cannot be resolved. The decision to remove a student from a team will be made by the Director of the Capstone Program in consultation with the Capstone faculty.

If a student is removed from a project, they will be assigned alternative tasks to satisfy the remaining course requirements. These alternative tasks will be determined by the course instructor and the program director. Students removed from a project will likely not be allowed to present at the Capstone Showcase.

Additionally, in other extreme cases, entire teams or individual team members may be prohibited from presenting at the Capstone Showcase. Such cases may involve academic dishonesty, intellectual property, or copyright issues.

Project Funding

Funding for projects is allocated based on various factors, including but not limited to project scope, required deliverables, and project health. All purchase orders should be placed through their capstone project mentor. If a student makes purchases directly, or through avenues that are not their capstone mentor, it is considered a donation to the project. Students will not be reimbursed for project expenses.

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; www.floridapoly.edy/disability.

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

Academic Integrity

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). *Recording class activities including, but not limited to, lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is* ***prohibited***.

Course Schedule (Tentative)

During the first four weeks, students will engage in intensive teaching and demonstration sessions to learn the principles of design thinking, empathy, problem definition, ideation, prototyping, testing, and public speaking techniques from Dale Carnegie's high-impact materials. This foundational phase will prepare students for hands-on project work by providing a solid understanding of the design process and key methodologies.

Following the initial teaching period, students will be assigned interdisciplinary projects that reflect the diverse challenges within their respective fields. These projects may involve developing physical prototypes, creating software applications, designing analytical models, or crafting business solutions. Students will work on conceptual designs, iteratively developing and refining their ideas to create alpha prototypes that effectively communicate the chosen direction for solving the given problem. This phase will culminate in final panel presentations and detailed project reports.

Weeks 1-6 Teaching and Demonstration

Week 1 (August 18, August 20, August 22)

- Introduction and Course Overview; Deep Dive into Design Thinking; Mini Challenge

Week 2 (August 25, August 27, August 29)

- Understanding Customer Needs; Defining the Problem; Preparing for Idea Generation

Week 3 (September 3, September 5)

- Concept Selection & Evaluation; Prototyping

Week 4 (September 8, September 10, September 12)

- Testing & Validation; Design Embodiment; Public Speaking (Part 1)

Week 5 (September 15, September 17, September 19)

- Public Speaking (Part 2); Public Speaking (Part 3); Standards

Week 6 (September 22, September 24)

- Ethics; Broader Impacts; Project Assignments

Weeks 7-16: Project Execution (Conceptual Design to Alpha Prototype)

Week 7-9: Initial Planning, Conceptual Design and Ideation

- Initial project planning and team roles
- Developing concepts and selecting the best solutions
- Iterative ideation and refinement

Week 9-10: Prototyping and Alpha Prototype Development

- Creating alpha prototypes for communication of the selected direction
- Gathering feedback and making necessary adjustments

Week 11-12: Testing and Validation

- Testing alpha prototypes and validating design choices
- Iterative improvements based on test results

Week 13-14: Professional Communication and Presentation Preparation

- Finalizing project documentation and preparing presentations
- Techniques for effective communication and public speaking

Week 15-16: Final Presentations and Reports

- Final project presentations to faculty and peers
- Submission of detailed project reports

Revisions to the Syllabus

The Capstone Faculty reserve the right to correct typos or other errors in the syllabus and make other reasonable adjustments to maintain the quality and integrity of the course in response to unanticipated circumstances.